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## **Reuse of residual sludge from stone-processing: differences and similarities between sludge coming from carbonate and silicate stones**

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Residual sludge coming from dimension stone working activities represents a serious environmental and economic problem both for Stone Industry and citizens. Indeed, most of time, residual sludge is landfilled because of the difficulties to recover it; such difficulties are mainly connected to local legislation and a lack of proper protocols. In general, it is possible to individuate two different categories of sludge: residual sludge coming from carbonate rocks (CS) and those coming from silicate rocks (SS). Both of them are characterised by a very fine size distribution. CS is composed mainly by the same compounds of the processed stones (marble, limestone, travertine). The reason of this is related to the very slow wear of diamond tools during processing which entails a negligible content of heavy metals. CS becomes very interesting, from an economic point of view, when it has a  $\text{CaCO}_3$  grade  $> 95\%$ . On the contrary, SS is characterised by high heavy metal and TPH content. Residual sludge from the processing of silicate rocks can be split in three different sub-categories, depending on the way they are produced, and in particular: sludge from gang saw using abrasive steel shot (GSS), sludge from multi diamond-saw block cutter (DBC), and mixed sludge (MS) from gang saw and block cutter. These three sub-categories show different problems connected to heavy metal content, indeed on the one hand GSS is characterised by a high percentage of Ni, Cr, Cu, etc., on the other hand DBC is characterised by Co and Cu high content.

In general, sludge, management of which in Italy is administered in accordance with the Italian Legislative Decree 152/06, can be used as waste from for environmental restoration or for cement plants. Several researches investigate the possible reuse of these materials but, at present time, there is no evidence of its systematic recovery as “recycled product” or “by-product”. On the basis of the results of these researches it is possible to highlight its recovery, after a proper treatment, mainly as: landfill waterproofing material; filler material for civil works; artificial soil for land rehabilitation and high value added products from carbonate rocks. Such “new products”, obtained from the treatment of residual sludge, have to be certified not only on the basis of their technical and physical characteristics but also by means of appropriate chemical analyses to guarantee that the products are not polluted.

The research will show a comparison between the characteristics of the two main sludge categories (similarities and differences), the environmental problems connected to sludge management, the potential applications for both the categories (CS and SS), highlighting the most promising ones (e.g., SS: artificial soil for land rehabilitation and filler material for civil works; CS: filler in high value added products as paper, rubber and paints), the problems connected to “new products” certification and selling, and some suggestions for executive protocols to boost their systematic recovery.